COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

DONALD L. WOLFE, Director

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ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

January 9, 2007

IN REPLY PLEASE
REFER TO FILE: WM-7

The Honorable Board of Supervisors
County of Los Angeles
383 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, CA 90012

Dear Supervisors:

ENHANCEMENT OF METHODOLOGY FOR PRIORITIZING STRUCTURAL BEST MANAGEMENT PRACTICES
MEMORANDUM OF UNDERSTANDING
ALL SUPERVISORIAL DISTRICTS
3 VOTES

IT IS RECOMMENDED THAT YOUR BOARD ACTING AS THE GOVERNING BODY OF THE LOS ANGELES COUNTY FLOOD CONTROL DISTRICT:

1. Find that the proposed Memorandum of Understanding is exempt from the provisions of the California Environmental Quality Act (CEQA).

2. Authorize the Chief Engineer of the Flood Control District (District), or his designee, to execute a Memorandum of Understanding, substantially similar to the enclosed Memorandum of Understanding, with the City of Los Angeles and Heal the Bay for the District to contribute $90,000 to fund the enhancement of a methodology to prioritize structural Best Management Practices.

PURPOSE/JUSTIFICATION OF RECOMMENDED ACTION

The Los Angeles area had a critical need to develop a methodology that would assist in the identification and prioritization of cost-effective Best Management Practices projects to meet water quality goals and objectives associated with urban runoff. A project team consisting of the District, City of Los Angeles, Heal the Bay, and GeoSyntec

Consultants was formed to collaboratively develop this methodology (Methodology). To assist in the effort, the District sought grant funding and was awarded a Proposition 13 grant for the Methodology development. The grant project was successfully completed in June 2006.

However, the Methodology needs further enhancement. A water quality model will be incorporated into the Methodology to quantify proposed project performance and water quality benefits. In August 2006, the City of Los Angeles was awarded another Proposition 13 grant for the enhancement of the Methodology. The District and City of Los Angeles agreed to contribute cash and in-kind services toward the successful completion of the project because an enhanced Methodology would have tremendous value for both agencies. The enhanced Methodology would allow for streamlining the implementation planning process and provide justification for the allocation of funds for high-priority water quality improvement projects.

Implementation of Strategic Plan Goals

This action is consistent with the County Strategic Plan Goal of Organizational Effectiveness by utilizing a collaborative effort to implement projects and Service Excellence by enhancing water quality, thereby improving the quality of life for citizens of the County of Los Angeles.

FISCAL IMPACT/FINANCING

The total cost of this study is estimated to be $330,000. The City of Los Angeles will contribute $240,000 of which $150,000 will be reimbursed by the State Water Resources Control Board through Proposition 13 grant funds. The District will contribute $90,000. Funding is available in the 2006-07 Flood Control District Fund.

FACTS AND PROVISIONS/LEGAL REQUIREMENTS

Enclosed is a Memorandum of Understanding between the City of Los Angeles, Heal the Bay, and the District. It has been reviewed and approved as to form by County Counsel.

ENVIRONMENTAL DOCUMENTATION

Execution of the enclosed Memorandum of Understanding is statutorily exempt from the provisions of CEQA pursuant to Section 15262 of the State CEQA guidelines. Any future project that may be proposed as a result of the enhanced methodology will undergo the appropriate environmental review.

IMPACT ON CURRENT SERVICES (OR PROJECTS)

There is no adverse impact on current services.

CONCLUSION

Please return three approved copies of this letter to Public Works.

Respectfully submitted,

DONALD L. WOLFE
Director of Public Works

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Enc.

cc: Chief Administrative Office
County Counsel

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING ("Agreement"), made and entered into this_____day of _____, 2006, by and among the CITY OF LOS ANGELES, a municipal corporation in the County of Los Angeles, hereinafter referred to as "CITY," the LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, hereinafter referred to as "DISTRICT," and HEAL THE BAY, a nonprofit organization in the State of California, hereinafter referred to as "HEAL THE BAY."

WITNESSETH:

WHEREAS, the CITY, DISTRICT, and HEAL THE BAY (collectively the "Parties") recognize the need to improve Los Angeles region water quality, protect compatible beneficial uses and help those receiving waters meet the State of California's regulations; and

WHEREAS, structural Best Management Practices (BMPs) may help achieve the water quality objectives associated with urban runoff; and

WHEREAS, the CITY is the lead applicant, and the DISTRICT and HEAL THE BAY are cooperating entities for funding through the California State Water Resources Control Board, to complete the Enhanced Methodology for Prioritizing Structural Best Management Practices Project, hereinafter referred to as "PROJECT;" and

WHEREAS, the CITY will accept the State funds in the amount of One Hundred Fifty Thousand and 00/100 Dollars ($150,000.00); and

WHEREAS, the Ballona Creek Watershed will be the applied example for the PROJECT; and

WHEREAS, the PROJECT will result in two work products: (1) an enhanced methodology for prioritizing the selection of structural BMPs in the county of Los Angeles, which will include supporting documentation, and (2) a report that details the application of this methodology to the Ballona Creek Watershed; and

WHEREAS, CITY, DISTRICT, and other stakeholders in the Los Angeles region may utilize the enhanced methodology to prioritize the selection of structural BMPs to assist their efforts to obtain maximum water quality benefits; and

WHEREAS, the work products that are generated from the PROJECT are intended to be used as planning level tools to assist efforts to achieve maximum water quality and are intended to be used by those who have sufficient knowledge and skill in the area of water quality; they are not substitutes for judgment; and

WHEREAS, the CITY, DISTRICT, and HEAL THE BAY will mutually contribute to research available structural BMPs to treat and control polluted runoff; and

WHEREAS, HEAL THE BAY is a nonprofit environmental group that is working to make the waters of Southern California safe and healthy for human, aquatic plant, and animal life, and that will bring considerable resources and expertise to the PROJECT; and

WHEREAS, the PROJECT cost is Three Hundred Thirty Thousand and 00/100 Dollars ($330,000.00); and

WHEREAS, HEAL THE BAY will administer and manage the PROJECT on behalf of the CITY and DISTRICT; and

WHEREAS, the CITY upon receipt of the State funds will transfer the funds to HEAL THE BAY. In addition, the CITY will provide Ninety Thousand and 00/100 Dollars ($90,000.00) and the DISTRICT will provide Ninety Thousand and 00/100 Dollars ($90,000.00) for the implementation of the PROJECT.

NOW, THEREFORE, founded upon the receipt of State funding, and in consideration of the mutual benefits to be derived by the Parties and of the promises herein contained, the Parties hereby agree as follows:

Section (1) CITY AGREES TO:

(1) Provide Ninety Thousand and 00/100 Dollars ($90,000.00), technical expertise, and administrative State contract funding services.

(2) Be mutually responsible with the DISTRICT for site investigations.

(3) Transfer Ninety Thousand and 00/100 Dollars ($90,000.00) to HEAL THE BAY within thirty (30) days of receipt of the fully executed Agreement to assist HEAL THE BAY in starting the PROJECT.

(4) Transfer Ninety Thousand and 00/100 Dollars ($90,000.00) to HEAL THE BAY within thirty (30) days of receipt of funds from the DISTRICT to assist HEAL THE BAY in starting the PROJECT.

(5) Upon receipt of the State funds, make the following transfers of State funds to HEAL THE BAY upon completion of the following milestones:

a. CITY will transfer Eighty Thousand and 00/100 Dollars ($80,000.00) upon completion of Section (3)-7a identified in this Agreement, to the satisfaction of CITY;

b. CITY will transfer Fifty Thousand and 00/100 Dollars ($50,000.00) upon completion of Section (3)-7b identified in this Agreement, to the satisfaction of CITY and;

c. CITY will transfer Twenty Thousand and 00/100 Dollars ($20,000.00) upon completion of Section (3)-7c and 7d identified in this Agreement, to the satisfaction of CITY.

Section (2) DISTRICT AGREES TO:

(1) Provide Ninety Thousand and 00/100 Dollars ($90,000.00) and technical expertise valued at no more than fifty thousand dollars ($50,000).

(2) Be mutually responsible with the CITY for site investigations.

(3) Transfer Ninety Thousand and 00/100 Dollars ($90,000.00) to the CITY within thirty (30) days of receipt of the fully executed Agreement to assist HEAL THE BAY in starting the PROJECT.

(4) As applicable to the data usage of the PROJECT, adhere to the terms and conditions in the Agreement with the State Water Resources Control Board (State Agreement).

Section (3) HEAL THE BAY AGREES TO:

(1) Accept the transfers of funds from the CITY and perform any and all work necessary to adequately and timely complete the PROJECT consistent with the scope of work attached as Exhibit 1.

(2) Adhere to all of the terms and conditions in the Agreement with the State Water Resources Control Board, including the Contractor Certification Clauses.

(3) Complete the PROJECT by December 31, 2008.

(4) Provide the CITY and DISTRICT with a detailed budget expense breakdown of all items related to the PROJECT no later than one (1) month after the completion of the PROJECT.

(5) Retain all records and supporting documentation pertaining to the performance of this Agreement for at least four (4) years after the completion of the PROJECT or for such longer period as may be specified in the State Agreement. Allow the State, CITY and DISTRICT auditor(s) access to such records during normal business hours and allow interviews of any employees who might reasonably have information related to such records.

(6) Indemnify and hold the CITY and DISTRICT harmless and reimburse the State, the CITY and/or DISTRICT, as applicable, if the State determines that the grant subcontracting regulations were violated.

(7) Provide the CITY and DISTRICT with the deliverables as outlined in the scope of work (Enhancement of the Los Angeles Countywide Structural BMP Prioritization Methodology to Create a Structural BMP Planning and Assessment Tool) attached as Exhibit 1.

a. An enhanced methodology for prioritizing the selection of structural BMPs in the county of Los Angeles, which will include supporting documentation

in the form of a technical memorandum;

b. Model documentation including descriptions of the datasets, analysis assumptions, and data summary statistics, explanation of analysis approach, example calculations, and GIS-based GUI for Expanded Methodology. A Draft User's Manual will also be a project deliverable;

c. Once final model documentation is assembled and made public, one technical/training workshop will be conducted, and outreach efforts and materials will be conducted/developed to inform agency staff of the tool, its use, and its capabilities;

d. Final User's Manual including Results of Limited test implementation in Ballona Creek Watershed.

Section (4) CITY, DISTRICT, AND HEAL THE BAY MUTUALLY AGREE AS FOLLOWS:

(1) Allowable costs and other requirements under this Agreement shall be consistent with the State Agreement.

(2) All Parties agree to reach consensus on the project deliverables at each milestone.

(3) CITY may terminate this Agreement upon giving two (2) days written notice if grant funding becomes unavailable.

(4) CITY's total cash obligation under the terms of this Agreement shall consist solely of CITY funds in the amount not to exceed Ninety thousand and 00/100 Dollars ($90,000) and State proceeds and shall not exceed a Total of Two Hundred Forty Thousand and 00/100 Dollars ($240,000.00).

(5) DISTRICT's total cash obligation under the terms of this Agreement shall consist solely of DISTRICT funds in an amount not to exceed Ninety thousand and 00/100 Dollars ($90,000.00).

(6) CITY reserves the right, in CITY's sole and absolute discretion, to terminate all or any portion of this Agreement for any reason upon giving thirty (30) days written notice to HEAL THE BAY and DISTRICT, unless a shorter time period is mutually agreeable to all Parties.

(7) DISTRICT reserves the right, in DISTRICT's sole and absolute discretion, to withdraw from this Agreement for any reason upon giving thirty (30) days written notice to HEAL THE BAY and CITY, unless a shorter time period is mutually agreeable to all Parties.

(8) HEAL THE BAY reserves the right, in HEAL THE BAY's sole and absolute

discretion, to withdraw from this Agreement for any reason upon giving thirty (30) days written notice to CITY and DISTRICT, unless a shorter time period is mutually agreeable to all Parties.

(9) Should the CITY exercise the right to terminate this Agreement, HEAL THE BAY and/or DISTRICT may recover from CITY any reasonable and necessary expenses to achieve the goals of this Agreement that were incurred by HEAL THE BAY and/or DISTRICT prior to the termination of the Agreement and that were incurred in reliance on the Agreement remaining in full force and effect.

(10) All parties agree that successful completion of the project is contingent on funds being available from the State Agreement.

Section (5) INDEMNIFICATION

Nothing in this Agreement shall create any obligation for the CITY, DISTRICT, or any related agency (e.g., the County of Los Angeles) to perform any obligation that may arise from the research and the PROJECT to install or otherwise implement structural BMPs in specific areas.

The Parties shall indemnify, defend, and hold harmless each other party, including its officers, agents, and employees, from and against any and all liability, including, but not limited to, demands, claims, actions, fees, costs, and expenses (including attorney and expert witness fees), arising from or connected with their acts and/or omissions arising from and/or relating to this Agreement.

Section (6) INDEPENDENT CONTRACTOR STATUS

This Agreement is by and among the CITY, DISTRICT, and HEAL THE BAY and is not intended, and shall not be construed, to create the relationship of agent, servant, employee, partnership, joint venture, or association, among the Parties to this Agreement.

HEAL THE BAY understands and agrees that all persons furnishing services on behalf of HEAL THE BAY to CITY or DISTRICT pursuant to this Agreement, for all purposes, including, but not limited to, Workers' Compensation liability, are not employees, agents, or otherwise entitled to benefits from the CITY or DISTRICT.

HEAL THE BAY shall bear the responsibility and liability for furnishing Workers' Compensation and/or proof of Workers' Compensation insurance and all other benefits required by law to any person for injuries arising from or connected with services performed on behalf of HEAL THE BAY pursuant to this Agreement.

Section (7) NOTIFICATION

(1) Notices desired or required to be given under this Agreement or any law now or hereafter in effect may, at the option of the party giving the same, be given by

enclosing the same in a sealed envelope addressed to the party for whom intended and by deposition of such envelope with postage prepaid in the United States Post Office or any substation thereof, or any public box, and any such notice and the envelope containing the same shall be addressed to the following representatives of the Parties, except that any party may change the address for notices by giving the other Parties at least ten (10) days written notice of the new address:

CITY:

Mr. Shahram Kharaghani, PHD., Stormwater Program Manager
City of Los Angeles Department of Public Works
Bureau of Sanitation
Watershed Protection Division
1149 South Broadway, 10th floor
Los Angeles, CA 90015

DISTRICT:

Mr. Mark Pestrella, Assistant Deputy Director
County of Los Angeles Department of Public Works
Watershed Management Division
900 South Fremont Avenue
Alhambra, CA 91803

HEAL THE BAY:

Mr. Mark Gold, D. Env., Executive Director
Heal the Bay
1444 9th Street
Santa Monica CA 90401

(2) In the event of suspension or termination of this Agreement, notices may also be given upon personal delivery to any person whose actual knowledge of such suspension or termination would be sufficient notice to HEAL THE BAY. Actual knowledge of such suspension or termination by an individual contractor or by the managing agent regularly in charge of the work on behalf of HEAL THE BAY shall in any case be sufficient notice.

Section (8) MUTUAL COVENANTS

(1) Governing Law: This Agreement shall be governed by, interpreted under, and construed and enforced in accordance with the laws of the State of California.

(2) Amendment: No variation, modification, change, or amendment of this Agreement shall be binding upon any party unless such variation, modification, change, or amendment is in writing and duly authorized and executed by all the Parties. This Agreement shall not be amended or modified by oral agreements

or understandings among the Parties or by any acts or conduct of the Parties.

(3) Entire Agreement: This Agreement constitutes the entire agreement between the Parties with respect to the subject matter of this Agreement and supersedes all prior and contemporaneous agreements and understandings.

(4) No Third Party Beneficiary/Successors and Assigns: This Agreement is made and entered into for the sole protection and benefit of the Parties and their successors and assigns. No other person shall have any right of action based upon any provisions of this Agreement.

(5) Waiver: No waiver of any breach or default by any party shall constitute a waiver of any other breach or default, nor shall any such waiver constitute a continuing waiver. Failure of any party to enforce at any time or from time to time, any provision of this Agreement shall not be construed as a waiver thereof. The remedies herein reserved shall be cumulative and additional to any other remedies in law or equity.

(6) Covenant: All provisions of this Agreement, whether covenants or conditions, on the part of HEAL THE BAY shall be deemed to be both covenants and conditions.

(7) Counterparts: This Agreement may be executed in any number of counterparts, each of which together shall constitute one and the same instrument.

(8) Interpretation: All Parties have been represented by counsel in the preparation and negotiation of this Agreement. Accordingly, this Agreement shall be construed according to its fair language and any ambiguities shall not be resolved against the drafting party.

(9) Assignment: No party shall assign this Agreement or any of such party's interest, rights, or obligations under this Agreement without the prior written consent of the other Parties, which consent shall not be unreasonably withheld except that any party may assign the Agreement, or any part thereof, to any successor governmental agency performing the functions of the assigning party as its successor.

Section (9) NEGATION OF PARTNERSHIP

Nothing in this Agreement shall be construed to render CITY or DISTRICT in any way or for any purpose a partner, joint venturer, or associate in any relationship with HEAL THE BAY, nor shall this Agreement be construed to authorize either to act as agent for the other unless expressly provided in this Agreement.

Section (10) SAVINGS CLAUSE

If any provision or provisions of this Agreement are for any reason adjudged to be unenforceable or invalid, it is the specific intent of the Parties that the remainder shall subsist, be, and remain in full force and effect.

Section (11) AUTHORITY TO ENTER INTO AGREEMENT

The individual(s) executing this Agreement on behalf of HEAL THE BAY, CITY, and DISTRICT attest(s), warrant(s), and represent(s) to be duly authorized to execute this Agreement.

Section (12) FINAL AGREEMENT APPROVAL BY CITY

Notwithstanding a recommendation by any office of the CITY, the leadership of the CITY retains the right to exercise its judgment concerning the terms and conditions of this Agreement, and to determine what best serves the interest of the CITY. The CITY Council and Mayor is the ultimate decision-making body and makes the final determinations necessary to arrive at a decision to award, or not award, an Agreement.
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IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the date first above written.

CITY OF LOS ANGELES

_____

By _____
Cynthia Ruiz, President
Board of Public Works

ATTEST:

Frank Martinez
City Clerk

APPROVED AS TO FORM:

ROCKARD J. DELGADILLO

City Attorney

By _____
Christopher M. Westhoff
Assistant City Attorney

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT

By _____
Donald L. Wolfe,
Chief Engineer

APPROVED AS TO FORM:

RAYMOND G. FORTNER, JR.

County Counsel

By_____
Deputy

HEAL THE BAY

By _____
Mark Gold
Executive Director

APPROVED AS TO FORM:

_____
Leslie Mintz

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EXHIBIT 1

SCOPE OF WORK

Enhancement of the Los Angeles Countywide Structural BMP Prioritization Methodology to Create a Structural BMP Planning and Assessment Tool.

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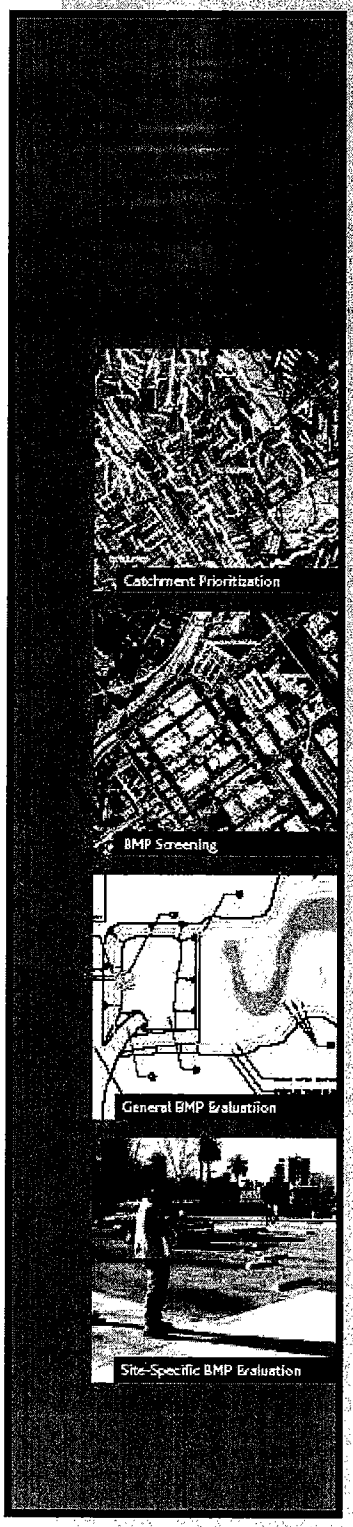


Enhancement of the Los Angeles Countywide Structural BMP Prioritization Methodology to Create a Structural BMP Planning and Assessment Tool

Prepared for:

Heal the Bay
City of Los Angeles - Bureau of Sanitation
County of Los Angeles - Department of Public Works

October 16, 2006

Prepared by:

GeoSyntec Consultants
2566 Overland Avenue, Suite 670
Los Angeles, CA 90064
310.839.6040
310.839.6041 (fax)

Enhancement of the Los Angeles Countywide Structural BMP Prioritization Methodology to Create a Structural BMP Planning and Assessment Tool

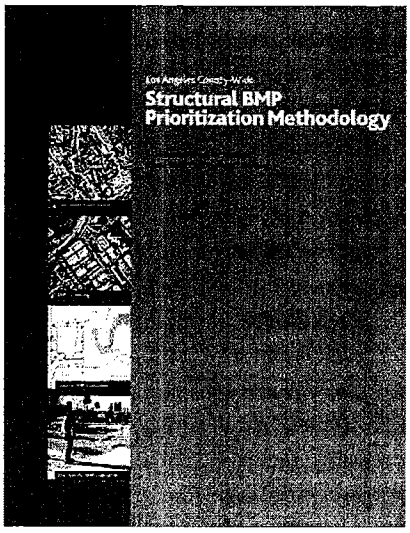
Project Objective

The objective of this project is to enhance and build upon the existing Los Angeles Countywide Structural BMP Prioritization Methodology (Methodology) to create a decision support tool that can be used by agencies to identify and prioritize potential structural BMP projects throughout Los Angeles County, as well as estimate planning-level costs and potential pollutant concentration and load reductions associated with implementation of the prioritized projects. This tool is then to be tested on approximately ten catchment areas in the Adams Drain subwatershed of the Ballona Creek Watershed, calibrated to channel discharge and water quality data provided by Los Angeles County for the Adams Drain, and then have its results extrapolated for the entire Ballona Creek Watershed.

Project Need

The motivation for this project has been and continues to be to address a critical need in the Los Angeles area to develop a practical tool that can assist in identifying and prioritizing the most cost-effective Best Management Practices (BMPs) projects toward meeting water quality goals and objectives. There is a critical need for quantifying the potential water quality benefits of their combined implementation. The Los Angeles area has numerous TMDL Implementation Plans and related efforts under development; these plans require not only strategic BMP selection, design and placement, but a method to assess anticipated improvements (i.e., "presumptive" performance of site-specific selected measures). A tool of this nature, with input from the regulated, regulatory, and environmental communities, would have tremendous value and would allow for streamlining the implementation planning process and allocation of funds for water quality improvement project efforts. The tool could assist efforts of local agencies to conduct overall implementation evaluations.

Project Description



This project will build upon the *Los Angeles Countywide Structural BMP Prioritization Methodology* – a new, systematic, flexible, transparent, and reproducible framework for prioritizing structural BMP projects to optimize pollutant reductions in a cost-effective manner. As background, the Figure 1 highlights the four steps of the Methodology, and shows an example product of the Methodology – a map of the Ballona Creek Watershed identifying the prioritized catchments as well as the BMP placement opportunity rankings. Implementation of the existing Methodology into a tool that estimates potential water quality benefits is expected to result in a more technically rigorous and defensible, planning-level identification of high priority BMP projects, including BMP type and location information. This next project phase would result in a GIS-based, hydrologic and water quality modeling decision support tool, based upon the

Methodology, that can be used to objectively evaluate and quantify project scenario benefits on a catchment or subwatershed scale using the most current data available. To accomplish this, BMP prioritization results and basic sizing information – including consideration of regional design storm criteria – would be utilized with BMP performance data to develop estimates of expected concentration and load reductions for a selected list of water quality constituents. These water quality benefits would be estimated with the aid of deterministic hydrologic modeling tools as well as stochastic water quality analyses.

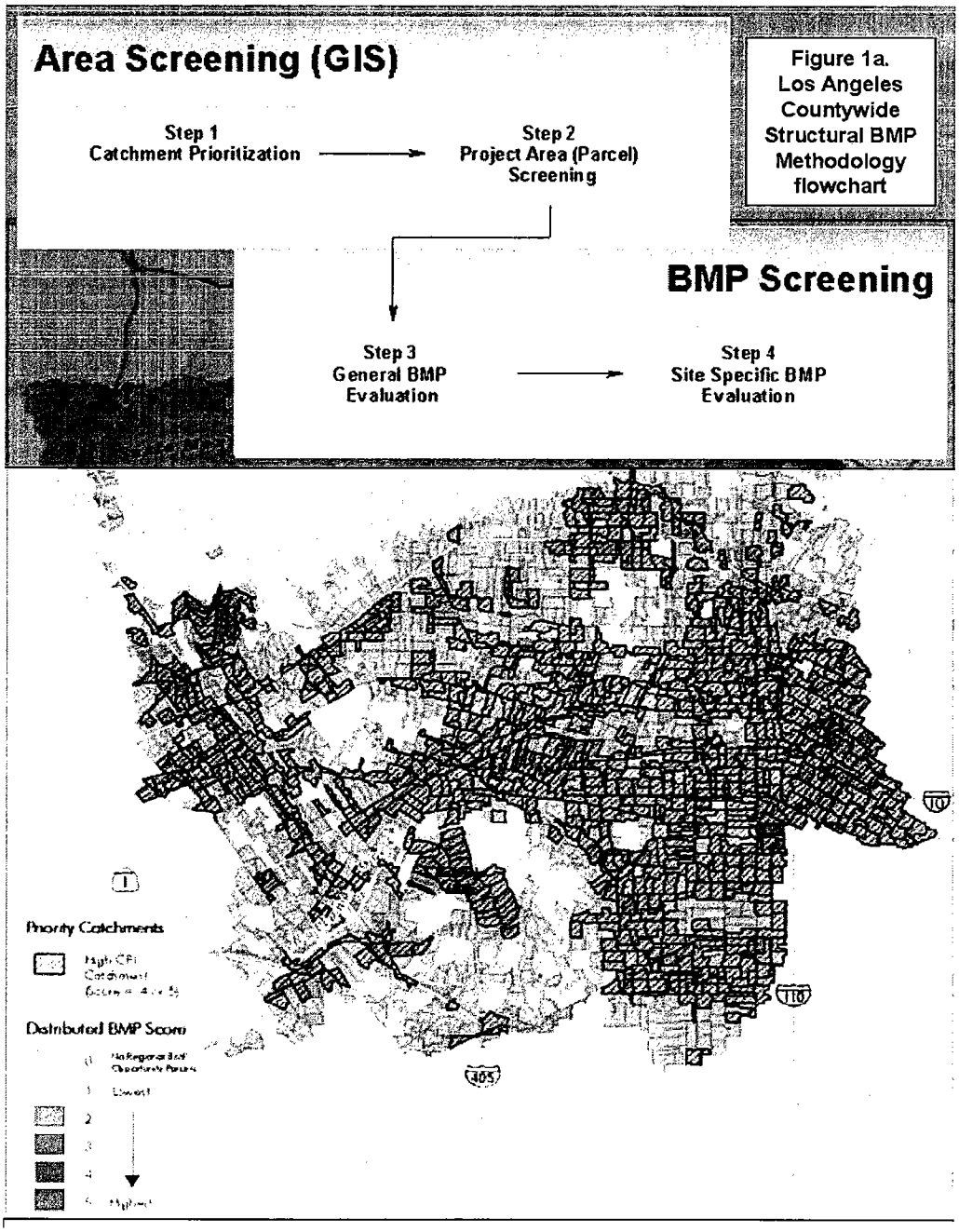


Figure 1. Methodology Steps and Example BMP Opportunity Map for Ballona Creek Watershed

Part 1 – Methodology Enhancement/Model Development

Two new elements (parts) are proposed for continuing project development. Part 1 is a Methodology enhancement/model development step which involves the following specific activities:

(a) Development of a GIS-based Graphical User Interface (GUI) to enhance the usability of the existing Methodology.
(b) Addition of catchment-scale hydrologic and water quality modeling elements to the Methodology (for comparison of pollutant load/concentration reduction predictions relative to prioritized project scenarios). This includes continuous deterministic hydrologic modeling combined with stochastic Monte Carlo water quality modeling (requiring incorporation of input data variability information and assumed BMP scenarios) for prediction of probabilistic-based water quality results.
(c) Addition of planning-level BMP cost (capital and operations and maintenance) estimation capability for modeled BMP scenarios.
(d) Modifying the GUI and enhanced Methodology toward a BMP selection, sizing, and placement decision support tool.
(e) Model documentation.

Through the GUI, users will have limited ability to review and adjust Methodology and model input parameter values, as well as apply the Methodology to a study watershed without requiring intimate knowledge of GIS applications. With the proposed Methodology enhancements described in items 1(b) through 1(d) above, users will be able to define estimated confidence levels for their hydrologic and water quality analyses, assess the uncertainty associated with the predicted water quality improvements, and identify optimized BMP scenarios given user preferences for cost, risk (i.e., of effectiveness and feasibility), and multi-benefit potential.

Description of GUI

The GUI will function as an extension to ESRI's ArcMap 9, adding a toolbar and series of custom interfaces to guide the user through the various data models and analysis steps. Specifically, this will include:

- Preset forms to input data layers and specify data and model parameters (e.g., specifying the land use data layer to be "landuse06.shp" and its land use type field to be "LU06");
- Automated data check and review system (e.g., "Warning: The user-specified fecal coliform EMC for land use type "commercial" is outside of the recommended range. Continue with CPI calculation or defer to default recommended EMC values?")
- Capsules to run various analysis steps, with options to walk the user step by step through the full analysis or skip ahead to any given modeling step;
- Help options with more detailed instructions and guidelines for the user.

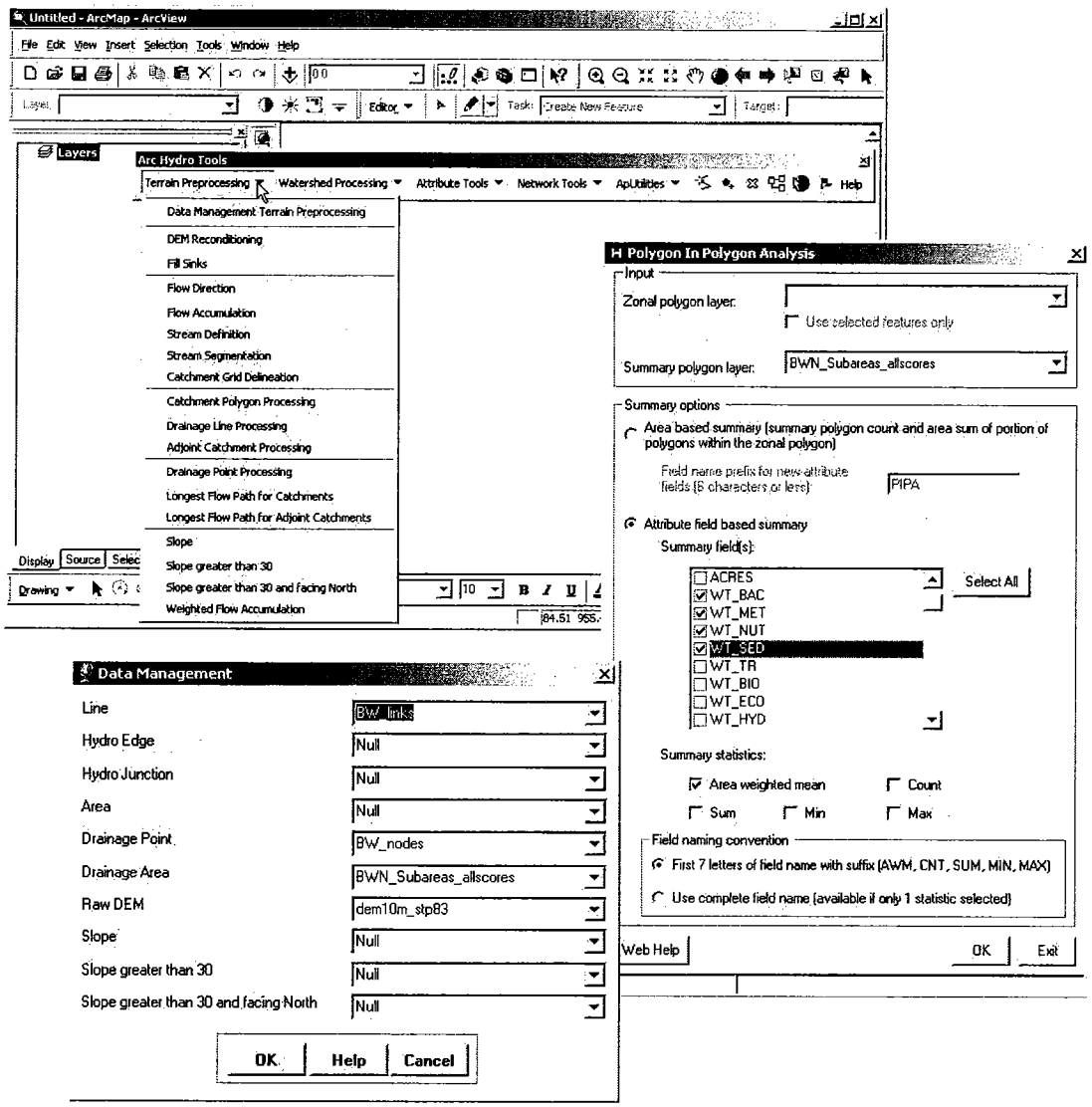


Figure 2. Example ArcMap Toolbar and Analysis Interface

The user will interact with both the GIS data and the tabular data (matrices) through the GUI. The user will be able to manually change certain variables within the matrices (e.g., 1-5 scores for the evaluated BMP options, % weights for the BMP evaluation criteria) and evaluate results (e.g., % of catchments with Infiltration Basin as preferred BMP).

Results will be stored as GIS datasets and Access databases. The ArcMap tools may interact with Microsoft Access databases (or personal geodatabases) to run queries, calculate statistics, and generate reports. Using ArcMap map templates and custom reports setup in MS Access, the user will be able to use the dataset created through the GUI to generate maps and reports for completed model runs.

The application will require a fully-functional, licensed version of ESRI ArcView 9 (or higher – ArcEditor or ArcInfo), ESRI ArcGIS 9 Spatial Analyst, and Microsoft Access 2000 or higher.

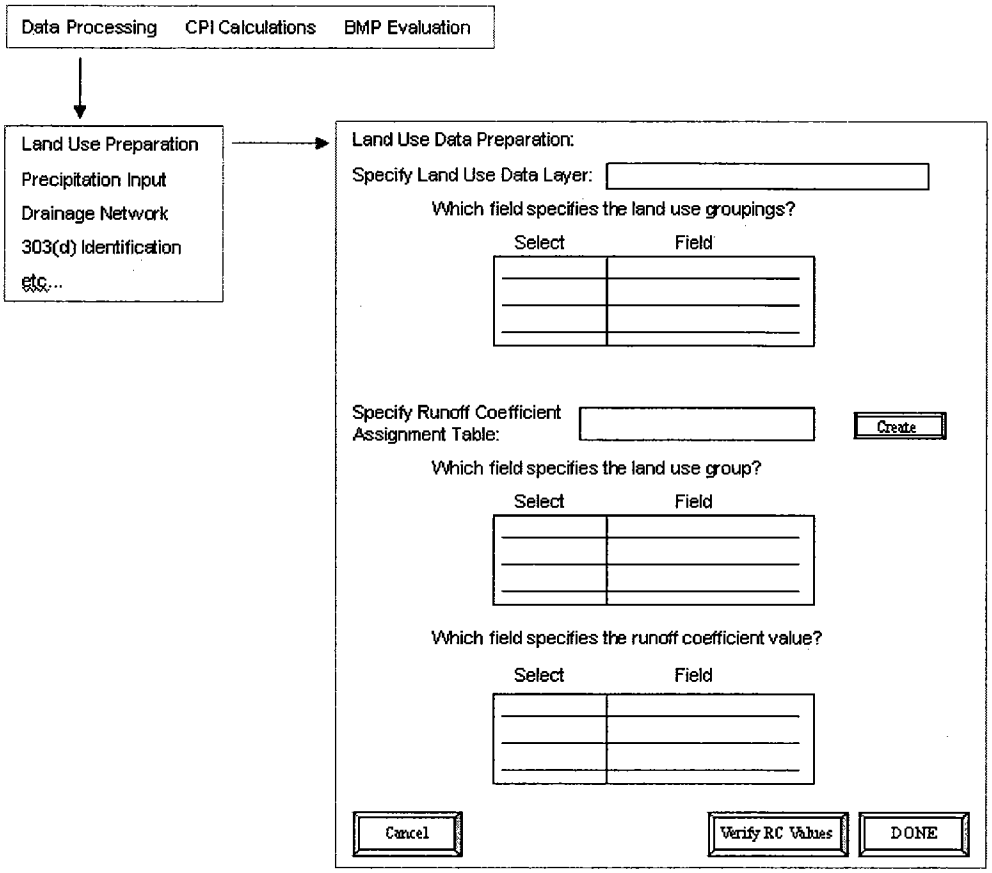


Figure 3. Example Input Parameter Entry Forms

The GUI will be used to guide the user through the steps of the Methodology and, ultimately, to facilitate use of this new decision support tool for identification and prioritization of potential structural BMP projects. With the proposed modifications to the Methodology, the tool will also enable the user to estimate planning-level costs[1] and potential pollutant concentration and load reductions[2] associated with implementation of the prioritized projects.

[1] Estimates of planning-level costs, including both capital and O&M components of total lifecycle costs, will be based on data compiled during development of the Methodology, and reported in Appendix D of the Guidance Manual, "Basis for Relative BMP Cost Scores" (for the Methodology's BMP comparison matrices). O&M costs and escalation factors (from the 2004 base estimates and for retrofit costs) will be discussed internally, with the final planning factors to be established by the City and County. For land acquisition information, users will be referred to independent parcel value websites, such as www.zillow.com, but coding for direct linkage will not be provided

[2] Estimates of pollutant concentration and load reductions will be based on catchment-scale statistical analysis. For compilation of results for multi-catchment study areas, single-catchment results will be summed (based on mass balance, in the case of concentrations) to compute approximate average cumulative downstream pollutant load and concentration reductions. Instream pollutant fate and transport processes, as well as variable time of concentration

Description of Modeling Approach

Through the addition of catchment-scale hydrologic and water quality modeling elements to the Methodology, water quality benefits can be compared amongst prioritized project scenarios. And through the incorporation of input data variability information, such as continuous rainfall and discharge data (for representative precipitation zones and soil types), and distribution of EMC and BMP effluent concentration water quality data, prediction uncertainty information can be quantified so that confidence levels and exceedance probabilities (e.g., probability that event mean concentrations for pollutant X will exceed water quality threshold Y at the discharge point from catchment Z) can be estimated. Finally, through the addition of planning-level BMP cost estimation capability for the modeled BMP scenarios, project costs can be compared and considered in light of predicted water quality benefits.

Continuous simulation of rainfall-runoff processes will be accomplished through the incorporation of the US EPA's Storm Water Management Model (SWMM)[3] into the GUI tool. SWMM will be used to predict storm volumes for the study catchments, based on continuous precipitation gauge data and catchment characteristics (such as SCS soil types, percent imperviousness, area, slope, and length), which will be compiled through the GIS-based GUI. A Visual Basic (VBA)-based automated linkage will be created in the GUI to feed GIS input data to SWMM, and then send SWMM output data to the Monte Carlo spreadsheets for compilation of storm volume frequency distributions (for random sampling in Monte Carlo). Model sensitivity analyses will be conducted separately to determine the most sensitive hydrologic input parameters. Model uncertainty analyses will then also be conducted separately on these most sensitive input parameters to determine how input parameter uncertainty could translate to predicted storm volume ranges. One significant early milestone for the project will be establishing a key set of hydrologic input parameters, their expected value ranges, and the conditions of the sensitivity and uncertainty analyses. A subsequent milestone will be a review of the analysis results by the project team.

Different BMP sizing criteria will be incorporated in the hydrologic analysis to assess the relative effectiveness and benefit of these alternatives.[4]

Subsequent to the SWMM modeling step, a stochastic, spreadsheet-based, Monte Carlo water quality model will be developed[5]. Monte Carlo[6] is a statistical sampling tool used to predict outcomes for uncertain conditions (such as for forecasting financial portfolio performance), given input parameter distribution information. For instance, given estimated frequency distribution information (e.g., log mean and log standard deviation data), inputs such as land use pollutant EMCs, can be "sampled" thousands of times in an automated spreadsheet. These sampled concentrations can then be run through the relevant

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issues associated with catchment outlets distributed spatially along a major stormdrain network, will not be considered as part of this multi-catchment results summary.

[3] For more information on the US EPA's SWMM model, see http://ccee.oregonstate.edu/swmm/.

[4] Up to three sizing scenarios may be considered for this analysis (e.g., 0.5 SUSMP, SUSMP, and 2xSUSMP). Sizing criteria will be finalized by management team prior to analysis.

[5] For the purposes of this proposal it was assumed that the proprietary program *@Risk* will be used to support this analysis. If desired and allowable within the existing budget, a visual basic (VBA)-based Excel add-in may be developed as an alternative approach to implementing the Monte Carlo analyses in the tool. The advantage of this alternative is that future users would not be required to purchase any proprietary risk analysis software.

[6] For a simple introduction to Monte Carlo simulation, see http://www.decisioneering.com/monte-carlo-simulation.html.

"model" calculations (such as a runoff mass balance for given land use mixtures for a study catchment), with the goal of predicting the possible ranges and probabilities of occurance for various output, such as pollutant concentrations and loads at a catchment outlet to the Creek or a tributary. More specifically, the Monte Carlo analysis will be used in the tool to estimate the frequency distribution of pollutant concentrations and loads at catchment outlets for existing conditions as well as for various proposed BMP implementation scenarios[7]. Prior to Monte Carlo modeling, statistical distributions will be established for the following input parameters: predicted runoff volumes and BMP percent captures (from SWMM), land use pollutant EMCs, and BMP effluent pollutant concentrations.

Why Uncertainty-based Modeling?

Recognizing the uncertainty inherent to water quality modeling analyses – stemming from natural meteorologic/hydrologic variability, as well as from uncertainties in EMC and BMP performance monitoring data – the next task would involve incorporation of variability information that is contained in the key water quality, hydrologic, and BMP performance and cost datasets. The results from this effort will provide for a more realistic, informed, and technically-sound basis for decision making and implementation planning activities.

Some advantages of the proposed stochastic (Monte Carlo) water quality modeling approach include:

1. **Capturing Variability of the Data.** By preserving the natural variability (including variability related to hydrology, spatial differences, reporting differences, limited datasets and other uncertainties) of the input datasets (as opposed to calibrating to "optimal" build-up/wash-off rates) decision makers would have information related to the estimated variability of scenario results (e.g., the *probability* of concentrations being less than a particular threshold). This allows knowledgeable users to understand the confidence of proposed estimates, as well as central tendencies. Without this information, output can potentially be misrepresented or misinterpreted to produce an unrealistic sense of reliability and confidence in the singular model predictions from deterministic models.[8]

2. **Model Simplicity.** The statistical modeling analysis approach is relatively straight-forward, thereby providing various important benefits.

   2a. **Number of Input Parameters**. Relatively few user input parameters would be required (e.g., pollutant build-up/wash-off rates not necessary), making for faster and simpler "calibration"[9]. By having fewer parameters to adjust, and with more data to support these parameters, less model uncertainty is introduced through the calibration process. In contrast, the build-up/ wash-off parameters of deterministic storm water quality models are difficult to calibrate[10]

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[7] For examples or precedent where similar probabilistic approaches are used for storm water quality modeling, see: Kreikenbaum, S., et. al., 2002, *Probabilistic Modeling as a New Planning Approach to Stormwater Management*, from 9th International Conference on Urban Drainage; Canale, R.P. and Effler, S.W., 1989, *Stochastic Phosphorus Model for Onondaga Lake*, Water Research, 23(8):1009-1016; USDOT FHWA, 1990, *Pollutant Loadings and Impacts from Highway Stormwater Runoff*, Pub No. FHWA-RD-88-006; and EIR water quality technical reports for various LA and Orange County new development projects (specific references furnished upon request).

[8] Canale, *et. al.*, 1989.

[9] Calibration is shown in quotes here because the probabilistic model will directly use land use EMC datasets rather than calibrate, or estimate, input parameter values based on them.

[10] James, W., et. al., 2003, *User's Guide to SWMM*, by Computational Hydraulics Institute.

and are particularly sensitive parameters[11] (thus highlighting the importance of calibrating these parameters accurately).

2b. **Simplicity of Model Processes.** Relatively simple water quality processes are modeled. It also translates to a more understandable analysis for the implementing user (potentially, GIS/Engineering staff with limited knowledge of or experience in storm water quality modeling). Therefore, this would be a more user-friendly tool that requires less user expertise and is less susceptible to user error.

2c. **Model Review Effort.** Relatively simple model development and input parameters will facilitate review of the analysis approach, resulting in shorter review time and less cost requirements for the entire project team. In contrast, a more complicated model documentation would have to be developed/provided and reviewed by staff with commensurate understandings of both the model (e.g., HSPF model) and the relevant pollutant build-up/wash-off mechanisms. In addition, there are many problems with asserting that pollutant sources can be accurately modeled with Build-up/Wash-off based models.

2d. **Model Implementation Effort.** Relatively few parameters and simpler processes also translate to fewer input requirements and shorter modeling time (for model development, calibration, and run), and therefore lower costs for model modification and implementation. This facilitates the potential for scenario evaluation.

2e. **Model "As Complex as Necessary".** Given the general rule of thumb in environmental modeling to use only as complex an analysis as is necessary[12] and/or supportable with data, the statistical approach better conforms to standard practice here as it would not generate more information (such as unnecessary and likely not accurate for many pollutants receiving water pollutograph output, or relationships between antecedent dry period and pollutant concentrations that have not been observed for many if not most pollutants) than is needed for the project. The proposed EMC-based analysis approach, as opposed to a pollutograph-based approach, is consistent with the project goal of evaluating long term stormwater quality impacts rather than detailed (and potentially more uncertain and inaccurate) intrastorm impacts or dynamics[13].

2f. **Automated Model Linkage.** The linkage between the Methodology and the water quality model could be automated and consistent with the GIS-based GUI for the statistical modeling approach. Utilizing different model approaches may result in a disconnection between the Methodology and the water quality model (i.e., for the deterministic approach where the GUI would guide users through the Methodology to develop recommended BMP scenarios, and then scenarios would be manually developed and transferred to others for simulation in their watershed models).

3. **Model Transparency.** Relatively simple set of input parameters, therefore making for more transparent analysis as fewer processes would need to be "hidden" from the user through the GUI in order to preserve understandability and user-friendliness. In contrast, use of a deterministic watershed model may require numerous assumptions, that may be hidden, implicit, and/or without adequate supporting data.

4. **Countywide Application.** The statistical modeling approach would be a tool that can be applied (once relevant GIS datasets are compiled) for watersheds throughout LA County. Other deterministic models would need to be developed, calibrated, and tested for other watersheds in

[11] Calabro, P.S. and Maglionico, M., 2002, *Comparison Between a Detailed Model and Two Simplified Models in Urban Stormwater Quality Simulation*, from 9th International Conference on Urban Drainage.
[12] Bay-Delta Modeling Forum's 2000 report, *Protocol for Water and Environmental Modeling.*
[13] McPherson, T.N., et. al., 2002, *Comparison of the Pollutant Loads in Dry and Wet Weather Runoff in a Southern California Urban Watershed*, Water Science and Technology, 45(9):255-261.

LA County, at significant cost to the agencies. This could result in a significant amount additional time and effort without tangible results.

5. **Decision Support.** The tool would be more useful for knowledgeable decision makers as it would be capable of providing information related to confidence levels (e.g., marginal improvement in confidence resulting from various BMP implementation scenarios) and probability of meeting water quality standards, which are themselves formulated in a probabilistic fashion (e.g., timescale-based, or percent of time, etc.). Significant resources are contemplated to address water quality needs. The statistical approach would provide the critical data required by policy-makers to evaluate the benefit (total and incremental benefit) of proposed measures, as well as providing reasonable expectations. Figure 4 highlights the tool's uncertainty-based output, in contrast to the more basic output of the original Methodology (i.e., prioritized projects). As more data become available, the uncertainty levels would be anticipated to decrease (and confidence increase) so that resources are progressively more appropriately allocated in highest-priority areas, using appropriate technologies. Furthermore, because the basis of the method is transparent, all sides can be provided with scientifically-based information from which to make management decisions.

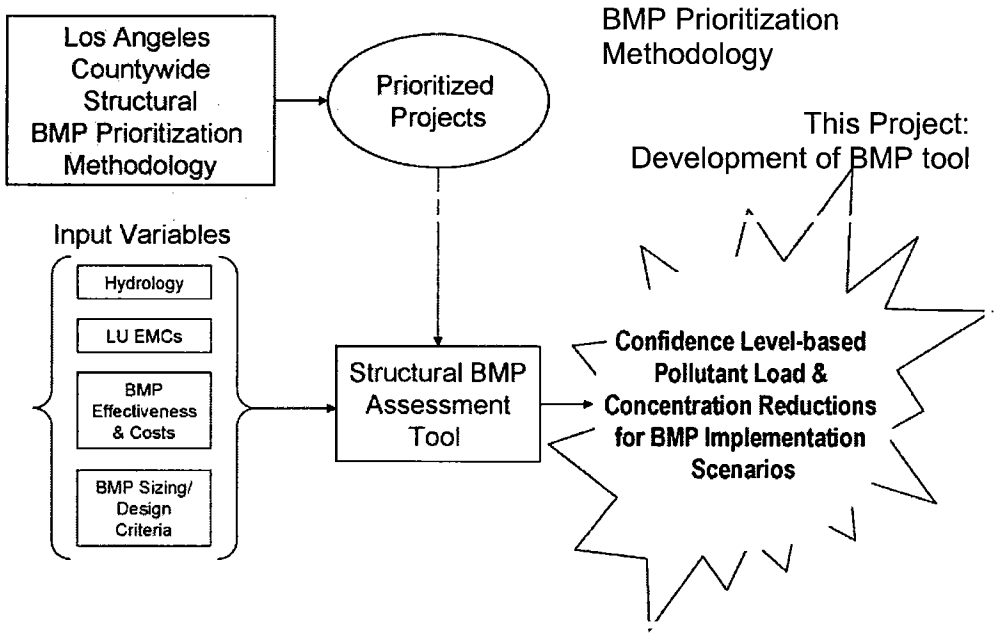

Figure 4. Flowchart Highlighting Methodology Enhancement Elements (in yellow)

Milestones and Deliverables

Project development will include a number of interim milestones that will require consensus from all project team members, who will consist of designated representatives from Heal the Bay, the City of Los Angeles, and the County of Los Angeles. Some items, such as the establishment of pollutant families of concern and BMP categories, have already been identified in the Methodology. Other items that will require consensus and agreement include BMP design storms/criteria, County precipitation gauges for inclusion in the tool, representative hydrologic input parameter value ranges, accounting for hydrologic prediction uncertainty, storm volume summary statistics, BMP capture estimation approaches, EMC statistics, BMP effluent concentration statistics, and BMP scenarios for water quality benefits evaluation.

It is recognized that developing consensus on multiple variables will require active participation and quick review from all parties. It is also recognized that it is likely that budget constraints will limit the extent of changes that can be made and these constraints must be included in the decision-making process.

Part 1 Deliverables: Model documentation will be provided and will include descriptions of the datasets, analysis assumptions, data summary statistics, explanation of analysis approach, example calculations, and GIS-based GUI for Expanded Methodology. A Draft User's Manual will also be a project deliverable.

Part 2 – Model Testing, Extrapolation & Outreach

Part 2 is a Model testing/validation step which involves the following activities:

(a) Limited testing and verification of the expanded Methodology tool on selected catchments or subwatersheds in the Ballona Creek Watershed. This includes analysis of Adams drain and comparison with recorded water quality and flow monitoring data.

(b) Within the Adams drain catchments, demonstration of land acquisition cost activities to illustrate protocols and provide example information that could be extrapolated (by others).

(c) Extrapolation of specific results (i.e., Adams drain analysis) to more general region-wide application, with ultimate goal of providing a gross planning-level estimate of potential implementation scenarios, benefits, and costs at a larger scale. Scenario results to include costs of implementation (land costs to be only evaluated for Adams drainage) with respect to changes in probability of meeting water quality targets. Examples of extrapolated information include: modeled runoff regression relationships, design storm BMP capture effectiveness, and prioritized project results for studied catchments.

(d) Final model documentation (with findings and recommendations from this testing step included), and

(e) Technical workshop and outreach efforts to support agencies' understanding and ability to implement the tool.[14]

This Model testing step is designed to increase user confidence as the tool is applied to a local study area, along with additional enhancements that are proposed based on "lessons learned" from the previous project, and as the application and results undergo extended technical scrutiny and project team review. Regarding verification of the hydrologic and water quality predictions, SWMM and Monte Carlo model results will be compared[15] to channel discharge (measured and/or modeled by MODRAT) and water quality data provided by Los Angeles County for the Adams Drain. Furthermore, the Methodology (i.e.,

[14] GeoSyntec scope to be limited to presentation development and one workshop. Coordination of workshop activities and advertising will be conducted by others.

[15] The term "compared" here is used to describe a qualitative process of comparing (graphically and qualitatively, via narrative discussion) predicted storm volumes and pollutant concentration ranges with observed values for the Adam's Drain subwatershed. Predicted volumes, concentrations, and loads at this subwatershed outlet will be based on aggregated catchment results since receiving water modeling is not a component of this scope. Because the hydrologic and water quality analyses will be conducted at the *catchment*-scale, in order to estimate storm volumes or pollutant loads for multi-catchment study areas, single-catchment results will have to be summed (based on mass balance, in the case of concentrations) to compute approximate average cumulative downstream values. Instream pollutant fate and transport processes, as well as variable time of concentration issues associated with catchment outlets distributed spatially along a major stormdrain network, will not be considered as part of this multi-catchment results summary.

structural BMP project prioritization) elements of the tool will be tested on approximately ten (10)[16] catchment areas in the Adams Drain subwatershed of the Ballona Creek Watershed. These prioritized BMP project results for the Adams Drain subwatershed will then be extrapolated[17] for the entire Ballona Creek Watershed, including implementation cost estimates and a demonstration of approximate land acquisition costs.

Once final model documentation is assembled and made public, one technical/training workshop will be conducted, and outreach efforts and materials will be conducted/developed to inform agency staff of the tool, its use, and its capabilities.

Phase 2 Deliverable: Final User's Manual including Results of Limited test implementation in Ballona Creek Watershed.

Project Use

The main project deliverable – a statistical water quality model and decision-support tool, expanding upon the existing Los Angeles Countywide Structural BMP Prioritization Methodology – could be used by Los Angeles area agencies to more quickly and cost-effectively develop water quality implementation plans (and in a more standardized fashion), facilitate regulatory and TMDL compliance by providing site-specific analyses, and assist with budgetary planning and fiscal accountability for water quality programs regionwide. It would also incorporate the latest information on BMP performance and analyses into decision making. This tool will build upon the approach and datasets developed for the City of Los Angeles' BMP pollutant load model, as well as other regional BMP planning and modeling efforts, as well as EPA/WERF and other research reports and guidance.

This user-friendly decision support tool will be available to assist municipalities and other watershed stakeholders to:

(1) Identify and prioritize structural BMP projects in their watershed(s), and
(2) Compare planning-level treatment costs and pollutant concentration/load reductions for various user-defined BMP implementation scenarios – including BMP types, sizing/design (e.g., a design storm–based sizing scenario), and locations.

An example type or format of output that could be generated through implementation of the Methodology, as it is applied by others for future watershed studies, is: "Given a specific BMP implementation scenario (where BMP types, locations, and design criteria or sizes are prescribed), we estimate a [0-100%] probability of meeting the specific water quality goal for pollutant [xx] at the stormdrain outlets for [0-100%] of the modeled catchments contained in the study subwatershed, or for

[16] The catchment areas specified here only include those catchments that will be analyzed in further detail (to desktop level evaluation). It is recognized that only very limited field investigations will be conducted, and may not constitute full field evaluations. Catchments will be selected to be representative of varying size, land use, and BMP opportunity conditions.

[17] The term "extrapolated" here is used to describe a process of estimating results (i.e., prioritized BMP projects for high priority catchments, and the approximate costs and water quality benefits associated with them) for the entire Ballona Creek Watershed based on results compiled for the tested catchments, and any trends or relationships inferred from those catchment results. The basis for extrapolation will be land use designation and areas, and BMP opportunity (or parcel) information.

the resulting hypothetical combined discharge of the modeled catchments. This probability estimate incorporates the variability and uncertainty associated with both the water quality and hydrologic input datasets." Or alternatively the results could be reported as, "All catchments in a given subwatershed will be able to achieve at least a [0-100%] probability of meeting the specified water quality goal for pollutant [xx]." It should be noted that analyses will be limited to <100 acre scale catchments, with study subwatersheds containing no more than 20 such catchments.

Assumptions and Exclusions

The following assumptions and exclusions are provided for clarification, and are relevant only the base scope of services (no optional tasks)

(1) Simulation of instream mixing, fate, or transport processes is not included (i.e., predicted loads and concentrations will apply at the point of discharge to the receiving water body only)
(2) Evaluation of institutional BMP solutions (i.e., the assessment will include structural BMP options only) are excluded from the base scope of work.
(3) Coordination with outside agencies and outside modeling efforts was not envisioned to be part of this work effort.
(4) Maximum project duration for this project is 20 months.
(5) The project team will coordinate through conference calls and periodic meetings on a monthly basis. Should meetings require consensus, it is assumed that project team members with decision authority will attend these meetings.
(6) One public workshop is assumed, with Heal-the-Bay or others providing all meeting coordination and document reproduction.
(7) Tool will be targeted to GIS users, and will consist of an ARC-add-in, but will not be a fully functional Internet-based tool.
(8) Outreach materials will consist of brief documentation, and electronic versions, but extensive reproduction of materials are excluded from this fee estimate.
(9) Any work items not explicitly described herein are excluded from the base scope of work.